Data on water fluoridation in Europe for the purpose of preventing dental caries are conveniently summed up in this report. It is worth noting that fluoridation of drinking water is slowly but surely being adopted in most European countries.

STATUS AND PROSPECTS OF FLUORIDATION IN EUROPE

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FLUORINE as a prophylactic against dental caries is becoming more and more important because of the progressive character of this disease. Up to now 98 per cent of the population of the highly civilized countries are affected by it. So ways and means must be found to prevent this widespread disease.

Experiments have been carried out to limit dental caries by preventive measures. These experiments were partly apt to delay dental decay, thus supporting the dentist's treatment, not, however, to prevent or, at least, reduce caries. Neither did propagating simple and natural nutrition or method of nutrition succeed in reducing caries. The extensive experiments on human nutrition, which resulted from the involuntary restrictions of nourishment and from the living conditions during the first and second World Wars and the post-war years have shown that the original cause of dental caries is to be found in modern nutrition and in the modifications of nutrition. The efforts of dental research tend more and more not only to early treatment, but to the prevention of dental caries from its beginning.

The fundamental studies of McKay and Dean on the relation between the amount of fluorine in the drinking water and the incidence of caries have demonstrated that the fluoride ion is an effective agent in preventing caries. A logical consequence of the investigations of McKay and Dean was the introduction of fluoridation in Grand Rapids and Newburgh in 1945.

The rapid development of the fluoridation of drinking water in the United States during the following years affected caries-prophylactic measures in other parts of the world, too. In non-European countries the fluoridation of drinking water was introduced in one or more communities in Canada, Argentina, Brazil, Chile, Paraguay, Venezuela, El Salvador, Colombia, the Panama Canal Zone, Puerto Rico, Australia, Hong Kong, Japan, Malaya, and New Zealand.

After extensive studies on the fluoridation of drinking water in the United States the first fluoridation installations in Europe were started in Norrköping (Sweden) and Kassel-Wahlershausen (Federal Republic of Germany). The next year Tiel in the Netherlands followed. According to the status of 1962 the drinking water of 18 European communities, serving a total population of one million persons, was fluoridated (Table 1).

These figures show that the fluoridation of the community water supplies of Europe has been extended but slowly.

Table 1—European Cities Provided with Fluoridated Water

Country	City	Number of Persons Provided with Fluoridated Water	F-Content of Drinking Water ppm	Introduction of Fluoridation Year
Belgium	Assesse	8,000	0.9	1956
	Braine-l'Alleud	14,000	1.0	1959
Bulgaria	Saleanovgrad		1.0 (natural F-content)	1954
CSSR (Czechoslovakia)	Brünn (Brno)	100,000	1.0	1959
	Klatovy	20,000	1.0	1962
	Tabor	18,000	0.8-1.2	1958
	Zdár n./Sáz	20,000	1.0	1962
Federal Republic of Germany	Kassel-Wahlershausen	6,000	1.0	1952
German Democratic Republic	Karl-Marx-Stadt	284,000	1.0	1959
Great Britain	Anglesey	27,000	0.9-1.1	1955
	Kilmarnock	50,000	1.0	1956
	Watford	72,000	1.0	1956
Hungary	Szolnok	43,000	1.0	1961
The Netherlands	Goeree-Overflakkee	33,000	1.0	1962
	Tiel	18,000	1.1	1953
Sweden	Norrköping	38,000	1.0-1.2	1952
Switzerland	Aigle	5,000	1.0	1960
	Basel	220,000	1.0	1962
Soviet Union	Winiza			1960
	Narilsk			1959
	(Kasachstan)			1959
	Leninokan			

The reasons for this fact vary. There is the general opinion that the American investigations are due to the habits of American life and nutrition and so do not completely apply to European habits. Therefore, fluoridation installations in the European communities are in the nature of pilot installations, serving to study separately the caries-protective value of fluorine in relation to the particular conditions of the different countries and to obtain technical experience in the dosage of the chemicals and in carrying out the fluoridation. It is on the basis of one's own perception and experience that further projects are to be decided on.

The effect and value of the application of fluorine can be judged only in terms of the results obtained by dental research on the reduction of caries. A balanced appreciation, however, will be possible only after a four-year period. As long as the first European results did not exist, there could be no extension of fluoridation in Europe.

Table 2—Growth of Fluoridation

Year of Fluoridation	Number of Fluoridated Communities	Number of Water Plants Using Fluoridation	Population Served
1952	2	2	44,000
1953	3	3	62,000
1954	3	3	62,000
1955	4	4	89,000
1956	7	9	219,000
1957	7	9	219,000
1958	8	10	237,000
1959	11	13	635,000
1960	13	15	640,000
1961	14	16	683,000
1962 (the first six months)	18	20	976,000

Furthermore, fluoridation as a collective measure has been considered to be an encroachment on the human right of decision. Ways were tried which permit individual prophylaxis. An alternative was seen in the fluoridation of milk, salt, bread, in administering fluoride tablets, and in dental treatment with fluoride solutions. The figures on the reduction of dental caries obtained by these methods are remarkably lower than those obtained by the fluoridation of the drinking water. The fight to propagate these various methods of fluoride ingestion must be considered one of the main reasons for the delay in spreading the fluoridation of drinking water.

The number of people benefiting from one of the most modern prophylactic health measures in Europe is rather low if compared to the number of those who use fluoridated drinking water in America. Only one million people used fluoridated water ten years after the first European fluoridation project had been started. Although water fluoridation in Europe did not succeed in extending to an equal number of people as in the United States, there has in the last two years been a positive development of

Table 3—Fluoridation Installations Projected in Europe

Country	City	Population
Ireland	Dublin	522,000
Yugoslavia	Belgrad	542,000
	Fiume (Rijeca)	75,000
	Split	76,000
The Netherlands	Amsterdam	869,000
	Groningen	142,000
	Rotterdam	719,000
Soviet Union	Murmansk	168,000

Table 4—Status of Reduction in Dental Caries by Fluoridated Drinking Water in Europe

Country	City			Reduction of Caries Per cent
CSSR (Czechoslovakia)	Brünn (Brno)	after 3 years of fluoridation	3– 4 year-old children	70
	Tabor	after 3 years of fluoridation	3– 4 "	80
			7–10 "	25
Federal Republic of Germany	Kassel-Wahlershausen		average of the various age groups	28
Great Britain	Anglesey	after 5½ years of fluoridation	3 year-old children	68
			4 "	51o
			5 "	56x
			6 "	25x
			7 "	9x
	Kilmarnock	after 5 years of fluoridation	3 "	55o
			4 "	56o
			5 "	42x
			6 "	24x
			7 "	15x
	Watford	after 5 years of fluoridation	3 "	73o
			4 "	53o
			5 "	44o
			6 "	25
			7 "	10
The Netherlands	Tiel	after 6 years of fluoridation	11–15 "	22–67
Sweden	Norrköping	after 7 years of fluoridation	7 "	52.4
			14 "	31.4

fluoridation. Whereas from 1952 till 1961 only 683,000 persons received fluoridated drinking water, this number increased by 293,000 during the first six months of 1962, i.e., an increase by 42 per cent (Table 2).

In eight other communities fluoridation installations are in the process of being prepared. As will be seen from Table 3, its growing popularity is above all characterized by the addition of four communities, serving populations of from 500,000 to 900,000.

The development of fluoridation of drinking water in both CSSR and the Netherlands shows that the stage of pilot installations is over and that fluoridation will be introduced more and more. This demonstrates the idea of the fluoridation of drinking water to be active in Europe, too. According to moderate estimates the number of people to receive fluoridated drinking water will, in the next two years, increase to three millions.

In 1959 the Danish Public Health Service propagated mechanical fluorida-

tion of drinking water up to the amount of 1 ppm fluorine. In Ireland the fluoridation of the drinking water was declared obligatory. The water fluoridation is being considered to start in two to four other towns of the German Democratic Republic. There are similar tendencies in England, Norway, and Hungary.

In the Soviet Union the prophylaxis of caries by means of fluorine has been judged very favorably by the Academy of Sciences. It is especially the application via drinking water which is considered promising. In the light of this evidence the fluoridation of the drinking water has been decided on in Narilsk, Leninokan, and Winniza. The fluoridation of the drinking water of Murmansk is being prepared.

In Europe the drinking water is fluoridated by means of sodium fluoride or sodium silicofluoride (Table 5). The first reports of dentists on the reduction of caries obtained by fluoridating the water of European communities show the same results, both with European nutrition and with American nutrition (Table 4).

The results obtained in Anglesey, Kilmarnock, Watford, and Norrköping seem to be especially encouraging. There do not exist any negative reports yet from the fluoridating communities, neither on some inefficiency of the application of fluoride nor on organic harm. Any detrimental changes resulting from the daily ingestion of fluoride of the commended quantities of 1 ppm fluorine in the drinking water are denied by all competent scientists and Public Health Services. The high figures of reduction of caries will doubtlessly accelerate the extension of the fluoridation of the drinking water of Europe. The committees of experts on water fluoridation formed in the last few years in several European countries, in which scientists, such as endocrinologists, physicians, pathologists, toxicologists, chemists, mathematicians, dentists, and engineers represent various disciplines of science, may

Table 5—Fluorine Compounds Being Used for Drinking Water Fluoridation in Europe

Country	Kind of Fluorine Compounds	Kind of Dosing
Belgium	NaF	Solution, containing 1% NaF
Czechoslovakia	NaF and Na_2SiF_6	Solution, containing 1% NaF and dry-feeding for Na_2SiF_6
Federal Republic of Germany	NaF	Solution, containing 3% NaF
German Democratic Republic	Na_2SiF_6	Solution, containing 0.4% Na_2SiF_6
Great Britain	NaF and Na_2SiF_6	Solution, containing 3.5% NaF and dry-feeding for Na_2SiF_6
Hungary	NaF	Solution, containing 1.2% NaF
The Netherlands	NaF and Na_2SiF_6	Dry-feeding for NaF and Na_2SiF_6
Switzerland	NaF	Solution

be regarded as a positive development of fluoridation. The mechanical application of fluoride is being considered in Europe the only promising caries-prophylactic method, too, just as the fluoridation of drinking water its most suitable form.

Summary

According to the situation in 1962, drinking water has been and is being fluoridated in 18 European communities with a total population of one million. Eight other communities are reported to be preparing fluoridation for three million people. The first results of fluoridating some European communities partially since 1952 as stated by dental research demonstrate that the reduction of dental caries is of the same order as that in the United States.

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